Quarterly Journal Fides et Ratio
Issue 67(3)2026, ISSN 2082-7067, Pages 27-41

Menstrual cycles in adolescent girls[1]

https://doi.org/10.34766/qvdj7065

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Received: 10 July 2026 | **Revised:** 25 August 2026 | **Accepted:** 28 August 2026 | **Published:** 22 September 2026

Abstract: *Background:* The menstrual cycle is a key indicator of a woman's reproductive health. Its regularity, length, and the characteristics of individual phases reflect the maturation of the reproductive system and the maintenance of hormonal balance. Adolescence is a particularly dynamic period, during which menstrual cycles often show considerable variability in length, irregularity, and ovulatory patterns. Despite its clinical significance, few studies have analysed the menstrual cycle in adolescents based on self-recorded cycle observation charts. The aim of this study was to characterize selected menstrual cycle parameters in girls aged 12–19 years and to compare these parameters according to the participants' gynaecological age. *Method:* The study included 103 girls aged 12–19 who completed menstrual cycle observation charts. They recorded parameters such as cycle length, duration of bleeding, presence of cervical mucus, basal body temperature changes, and additional symptoms such as dysmenorrhea or intermenstrual spotting. Statistical analysis of the empirical data was conducted, taking into account the participants' biological and gynaecological age. *Results:* The average cycle length among girls who had been menstruating for ≤3 years was approximately 28.7 days, while in those menstruating for >3 years, it was approximately 30.8 days. The shortest recorded cycle lasted 18 days, and the longest 54 days. A 6-day bleeding duration was reported by 31.1% of participants, making it the most frequently observed length. The most frequently observed luteal phase length was 13 days. Fertile-type cervical mucus was typically observed around day 16 of the cycle, with peak mucus secretion occurring on days 19–20. Menstrual pain was recorded in 17.5% of all charts; however, information on the presence or absence of menstrual pain was missing in 46.6% of charts. Cycles without features suggestive of ovulation were more frequently observed among girls in the early years following menarche. *Conclusions:* Menstrual cycles in adolescent girls show considerable variation in length and associated symptoms, consistent with literature describing the immaturity of the hypothalamic–pituitary–ovarian (HPO) axis during this stage of life. Following prior training, most participants were able to record selected menstrual cycle parameters in accordance with the adopted self-observation protocol. However, interpretation of these findings should take into account that the study focused on the recording of cycle parameters and did not include independent validation of the accuracy of self-observation.
Keywords: adolescence, menstrual cycle, reproductive health, sexual maturation

1. Introduction

The ecological approach to fertility, also referred to as the ecology of procreation or the ecology of the womb, is a lifestyle and model of healthcare based on the full acceptance, observation and protection of the natural human fertility biosystem without pharmacological or mechanical intervention (Fijałkowski, 2011).

Accordingly, elements relating to menstrual-cycle observation may constitute a valuable educational tool, supporting an understanding of the physiology of one's own body and the development of responsible health-related attitudes among adolescent girls (Bhoda et al., 2024; Jones & Baldwin, 2025). To date, relatively few scientific studies have

1 Article in Polish language: https://stowarzyszeniefidesetratio.pl/fer/67p_Pytk.pdf

examined menstrual-cycle observation in adolescent populations, which provides grounds for undertaking the present study.

Younger members of Generation Z have grown up in an era of widespread internet access and rapid digital development. Being raised in such an environment has shaped their ways of functioning and learning, their perception of reality, and the expectations they formulate towards life and public institutions, including the healthcare system. This generation is characterised by high information needs and a desire for rapid and convenient access to reliable data, particularly in the field of health (Freund, 2024; Nowicka, 2020). Despite their considerable digital competence, young women in this generation may experience difficulties with conventional self-observation of the menstrual cycle, which involves using a printed chart and manually recording observed fertility signs. Although new electronic devices for measuring body temperature and cervical mucus, as well as hormonal analysers, are available on the market, they are not yet widely used among young girls. Examples include electronic ovulation thermometers (Microlife MT 16C2 and MT 1662), an automatic ovulation thermometer (ATOs J5M, CITIZEN T915), electronic fertility monitors (BIOSELF, Microlife MT 16C2 and MT 1662), devices supporting cervical-mucus interpretation (OVACUE Fertility Monitor), and hormonal analysers (Persona, CLEARBLUE). Cycle observation can also be learnt through websites (www.psnnpr.com, www.iner.pl), after which fertility signs may be recorded using established smartphone applications. These include Ctlife, developed by the Polskie Stowarzyszenie Nauczycieli Naturalnego Planowania Rodziny (PSNNPR) [Polish Association of Natural Family Planning Teachers], which teaches the double-check symptom–thermal method (the so-called English method) developed by Dr Ann Flynn and Professor John Kelly of Queen Elizabeth Birmingham Maternity Hospital, and INERCYCLE, developed by the Institute of Natural Family Planning (INER), which promotes the method of Professor Josef Rötzer. Both methods require prior instruction by a trained instructor. Other applications supporting interpretation of the menstrual cycle are not always tested by their developers, which may reduce their effectiveness. The strong interest of Generation Z in ecology, health and information technologies creates favourable conditions for promoting digital tools for cycle self-observation. Consequently, instructors or teachers of fertility-awareness methods should make use, during instruction, of reliable electronic tools available via the internet and smartphones.

The need to obtain information independently and the growing interest in procreative health (Piasecka et al., 2024) encourage critical analysis of available contraceptive methods, including reflection on the adverse effects associated with hormonal agents. This is attributable both to greater health awareness and to the desire for greater control over one's own body (Cetera et al., 2025).

In describing the menstrual cycle in women, particular attention is paid to its length and to whether the cycle is ovulatory or anovulatory. The latter characteristic is especially important for women planning to have children, as the cyclical changes occurring in the female body constitute an important indicator of procreative health. Certain deviations from the physiological course of the cycle may, however, indicate disorders or disease (Piasecka et al., 2023; Stępkowska & Przygodzka, 2020; Ślizień-Kuczapska et al., 2020).

Observing one's own menstrual cycle by recording symptoms and sensations regarded as the principal fertility signs enables women to participate actively in monitoring their procreative health and may also provide a basis for seeking medical assistance at an early stage.

The menstrual cycle results from complex, regular cyclical changes involving both the ovaries and the uterine mucosa. These processes give rise to monthly menstrual bleeding through the interaction of hormones and the reciprocal hormonal relationships between the hypothalamus, pituitary gland and ovaries (Pawelczyk & Banaszewska, 2021; Hoffmann & Strauss, 2021). The cycle is defined as the period from the first day of menstrual bleeding to the day preceding the onset of the subsequent bleeding. In the Polish population, menstrual-cycle length most commonly centres around 28 days, with possible deviations of several days. Among young women,

however, variations ranging from 21 to 36 days may also be considered physiologically normal. Thus, if a woman has short cycles (from 21 days), medium-length cycles (28 ± 3 days), or long cycles (up to 36 days), and each of 11 cycles can be assigned to one of these three groups, the cycles may be regarded as normal and regular. Once a year, a cycle may be markedly different in length owing, for example, to severe stress, exhaustion, dietary changes, travel and climatic change, illness, medication, or alcohol consumption. In healthy women over 21 years of age, menstruation should already be regular. Menstrual-cycle length is an individual characteristic dependent on genetic and hormonal factors as well as lifestyle (Pogodina et al., 2022).

In Europe, the physiological age range for the onset of puberty in girls is generally considered to be 8–13 years (Zachurzok, 2017). Deviations from the physiological timing of pubertal onset may take the form of precocious or delayed puberty (Troszyński, 2009).

The onset of the first menstruation represents an appropriate point at which girls may begin observing their menstrual cycle. Education is best initiated under the supervision of a mother familiar with a fertility-awareness method or a certified method instructor. During the first two or three years following menarche, cycles may vary considerably in length, ranging from 21 to 45 days, and are often anovulatory, while menstrual bleeding may also vary in abundance (Itriyeva, 2022). The first menstrual cycles during puberty are generally irregular, and luteal insufficiency may be physiological during this period. Maturation of the hypothalamic–pituitary–ovarian axis progresses gradually during the years following menarche (Troszyński, 2009). Studies indicate that as many as 85% of cycles may be anovulatory during the first year after menarche, with this proportion falling to approximately 59% after three years (Ślizień-Kuczapska et al., 2020). Gynaecological age makes it possible to compare girls who have already begun menstruating. There is, however, no current tool for assessing development before menarche based on the degree of maturation of secondary sexual characteristics. The standard has therefore become gynaecological age, determined by the occurrence of menarche. Subsequent years are classified as positive values (+1, +2, +3, etc.) (Błogowska & Rzepka-Górska, 2004).

Observing the cycle from the time of the first menstruation enables girls to gain a better understanding of the physiological processes associated with maturation, supports acceptance of these changes, and promotes awareness of their own procreative health. The gradual introduction of successive fertility biomarkers, beginning with basal body temperature and followed by observation of cervical mucus, may prove useful in monitoring the course of the cycle and identifying changes that may require medical consultation (Najmabadi et al., 2021; Ślizień-Kuczapska et al., 2020). This knowledge is important not only for the young woman but also for the qualified physician, who should be able to identify possible abnormalities requiring preventive measures or treatment on the basis of menstrual-cycle observation charts.

2. Own research

2.1. Aim

The aim of the study was to characterise selected menstrual-cycle parameters in girls aged 12–19 years on the basis of self-observation charts and to compare these parameters according to the participants' gynaecological age.

2.2. Specific aims

What differences in menstrual-cycle length exist between girls during the first three years following menarche and girls with a gynaecological age of more than three years?

What is the frequency of cycles without features suggestive of ovulation among girls during the first three years following menarche compared with their peers with a longer gynaecological age?

Combining the literature review with the authors' own research made it possible to address the subject comprehensively, from objective physiological processes to the subjective experiences of young women associated with the menstrual cycle.

The specific objectives included characterising selected menstrual-cycle parameters and fertility biomarkers: comparing biological age, calculated from birth, with gynaecological age, defined as the time elapsed since menarche; determining the number of days of menstruation; establishing the minimum and maximum cycle lengths and luteal-phase length; recording the day of first observation of cervical mucus and fertile-type mucus; observing the rise in basal body temperature (BBT); and recording menstrual pain and intermenstrual spotting.

2.3. Research hypotheses

H1. Menstrual-cycle length will differ between girls within the first three years following menarche and girls with a gynaecological age of more than three years.

H2. Cycles without features suggestive of ovulation will be observed more frequently among girls within the first three years following menarche than among girls with a longer gynaecological age.

3. Method

The study included 103 girls aged 12–19 years. The participants had previously been trained to conduct menstrual-cycle self-observation in accordance with the principles of the double-check symptom–thermal method. Instruction took place in the home and was provided by the girls' mothers or other close persons who were attending a course leading to certification as a Natural Family Planning (NFP) teacher in this method. Those providing instruction were required to demonstrate appropriate substantive and methodological preparation, and the teaching process took place under the supervision of instructors authorised to train NFP teachers. Owing to the retrospective nature of the study and the scope of the available documentation, it was not possible to establish reliably what proportion of participants had been taught directly by their mothers or other close persons and what proportion had been taught by NFP teachers. Cycle-observation charts and survey questionnaires were obtained from the Polish Association of Natural Family Planning Teachers (PSNNPR).

The study employed diagnostic and descriptive research procedures aimed at characterising selected features of menstrual cycles in adolescent girls on the basis of data derived from their cycle-observation charts. The analysis focused on cycle length, the occurrence of features suggestive of ovulation, and other physiological parameters relevant to the assessment of procreative health.

The principal research technique was document analysis, consisting of a detailed assessment of the menstrual-cycle observation charts completed by the participants. The self-observation charts included menstrual bleeding, including intermenstrual spotting, the occurrence and characteristics of cervical mucus, BBT, and menstrual-cycle length. On the basis of the accepted rules for interpreting menstrual cycles according to the double-check symptom–thermal method, the analysis considered such cycle features as a rise in BBT, the presence of fertile- or infertile-type cervical mucus, identification of the mucus peak, and the co-occurrence of changes in mucus and temperature.

In the present study, the research method was document analysis. The material analysed comprised observations of adolescents' menstrual cycles. The self-observation charts contained parameters including menstrual bleeding (including intermenstrual spotting), the occurrence and characteristics of cervical mucus, basal body-temperature values, and menstrual-cycle length. According to the accepted rules for interpreting menstrual cycles under the multi-indicator method, the analysis considered features such as the temperature rise, the occurrence of fertile- and infertile-type mucus, the mucus peak, and the correlation between mucus and temperature. All participants measured their basal body temperature (BBT). Twelve-year-old girls experienced difficulties in measuring BBT, mainly owing to the lack of a regular routine, sleep patterns and technical errors. BBT measurements in adolescents, used for observing fertility indicators, were taken orally. An absence of explicit information concerning menstrual pain was treated as missing data rather than as evidence that

symptoms were absent. Because the documentation was analysed retrospectively, the reason for missing entries could not be established with certainty.

Document analysis was conducted on two levels: internally, focusing on the content of the documents, their interpretation and explanation; and externally, assessing the time and circumstances in which they were produced and establishing their reliability.

The document-analysis method used in the present study was supplemented by an interview conducted with a questionnaire obtained from the PSNNPR Training Committee. The questionnaire included questions concerning, among other things, age at menarche, the respondent's biological and gynaecological age at the time of observation, the occurrence of menstrual pain, and medication use during the observation period. The project did not require review by a bioethics committee because of its retrospective and non-invasive nature. The analysis was limited to anonymised observation charts collected in previous years. No additional diagnostic or therapeutic procedures were performed. For underage participants, consent was obtained from their parents or legal guardians and from the participants themselves.

The collected data provided the basis for statistical analyses and assessment of the research hypotheses. Analyses were performed using IBM SPSS Statistics, version 28.0.1.1. Categorical variables were presented as frequencies (n) and percentages (%), while selected quantitative variables were described using means and standard deviations. Relationships between categorical variables were assessed using Pearson's χ^2 test after checking expected cell counts in contingency tables. Where cell counts were small, appropriate exact tests were used or, where substantively justified, categories were combined. The frequency of cycles without features suggestive of ovulation was compared between the two gynaecological-age groups using Fisher's exact test. Mean menstrual-cycle length was compared between the two gynaecological-age groups using an independent-samples Student's t-test. Statistical significance was set at $\alpha = 0.05$.

4. Results

4.1. Characteristics of the study group

The study included 103 adolescents aged 12–19 years who had already experienced menarche. Menstrual-cycle analysis was based on data from observation charts and included both qualitative and quantitative information, allowing the analysed cycle parameters to be characterised and the study groups to be compared.

The participants came from different regions of Poland. The purposively selected adolescents were menstruating and wished to observe their cycles. They learnt to do so under the supervision of teachers from the Polish Association of Natural Family Planning Teachers. The girls had previously been introduced to the principles of fertility-awareness observation using the double-check symptom–thermal method. NFP teachers were responsible for interpreting the data recorded by the participants on the charts. Analysis of the documentation showed that, following standardised instruction by a method teacher, most participants were able to record selected cycle parameters. NFP teachers reviewed the observation charts and added their own comments. During meetings with the girls, they were asked to complete missing entries if they could remember them, and errors appearing in the cycle charts were explained. One, the most completely completed, menstrual-cycle observation chart was selected for analysis. The first two were excluded because of numerous omissions associated with the participants' stage of learning. The study was anonymous, and the analysis concerned data from one complete menstrual cycle recorded on an observation chart. In the case of underage girls, consent was obtained from their parents or legal guardians and from the participants themselves.

The results were divided into two groups according to the participants' gynaecological age. The first group comprised girls who had been menstruating for no more than three years, while the second comprised girls whose menstrual experience exceeded three years. This division was introduced because the menstrual cycle may become more stable approximately three years after menarche.

Table 1. Descriptive statistics of the biological and gynaecological age of the girls studied (N = 103)

Variable	M	SD	Mdn	Min	Max
Biological age	16,36	1,74	16	12	19
Gynaecological age	3,62	1,52	4	1	6

M = mean; SD = standard deviation; Mdn = median; Min = minimum value; Max = maximum value.

The study group comprised girls with a biological age of 12–19 years. The largest proportions of participants were aged 16 (28.2%) and 17 (23.3%). Notably, three of the twelve-year-old participants reported having menstruated for more than three years, which may indicate that menarche occurred before the age of nine. The overwhelming majority of girls with longer menstrual experience (more than three years) were aged 16–19 years.

The biological and gynaecological ages of the participants varied within the study group, as shown by the descriptive statistics in Table 1.

The data presented in Table 1 show that the mean biological age of the participants was approximately 16 years and four months. The youngest participants were 12 years old and the oldest 19. The mean gynaecological age in the study group was approximately three years and seven months. The participants included both girls who had been menstruating for approximately one year and girls whose menstrual experience already amounted to six years. The findings indicate considerable variation within the study group, reflected in the standard-deviation values.

The results indicate substantial diversity in both biological and gynaecological age among the school-age girls included in the study. Precocious menarche (before the age of nine) may significantly influence the subsequent course of menstrual cycles. The occurrence of such irregularities may be associated with immaturity of the hormonal axis or with occult pathological processes.

4.2. General characteristics of the menstrual cycle in adolescent girls

As part of the study, participants answered questions enabling assessment of the course of their menstrual cycles. One of the parameters analysed was the duration of menstruation, the distribution of which is presented in Table 2.

The young women recorded the duration of menstrual bleeding on their observation charts. Analysis showed that the largest proportion of respondents (31.1%) reported six-day menstruation. This result was more common among girls who had been menstruating for more than three years (32.7%) than among those with up to three years of menstrual experience (29.2%).

A small proportion of participants reported shorter bleeding lasting three or four days. Five-day menstruation was reported by 20.4% of participants, while the longest, nine-day bleeding, was observed in 6.8%.

Table 2. Duration of menstrual bleeding according to gynaecological age

Bleeding duration	Up to 3 years, N	%	More than 3 years, N	%	Total, N	%
3 days	1	2.1	0	0.0	1	1.0
4 days	6	12.5	3	5.5	9	8.7
5 days	8	16.7	13	23.6	21	20.4
6 days	14	29.2	18	32.7	32	31.1
7 days	10	20.8	10	18.2	20	19.4
8 days	7	14.6	6	10.9	13	12.6
9 days	2	4.2	5	9.1	7	6.8
Total	48	100.0	55	100.0	103	100.0

The Fisher–Freeman–Halton exact test was used to compare the distribution of bleeding duration between the groups, p = .634.

It should be emphasised that the duration of menstrual bleeding did not differ significantly between the gynaecological-age groups (p = .634).

Analysis of the data shows that menstrual bleeding among the adolescents studied lasted between three and nine days, with a mean duration of approximately six days. The results were clearly dispersed, as reflected in the standard deviation of 1.38.

The mean menstrual-cycle length among adolescents who had been menstruating for a relatively short period (up to three years) was approximately 28–29 days (M_1 = 28.73). Among girls with longer menstrual experience, the mean was slightly higher, at approximately 30–31 days (M_2 = 30.8). Variation in cycle length was observed in both groups, as indicated by the standard deviations (SD_1 = 6.92; SD_2 = 5.09). Despite the apparent difference between the group means, this difference was not statistically significant (p = .084). Descriptive statistics are presented in Table 3.

The shortest menstrual cycle recorded among the adolescents was 18 days, while the longest was 54 days. Cycle length varied considerably, as indicated by the relatively high standard deviation (SD = 6.07). The mean cycle length among the adolescents was close to 30 days (M = 29.84).

Luteal-phase length is presented in Table 4. The analysis shows that the largest group of girls (17.5%) had a luteal phase lasting 13 days. The shortest recorded luteal phase lasted six days (1.9% of participants), while the longest lasted 21 days (1%). Statistically significant differences were observed between the groups ($\chi^2(3, N = 100) = 18.49$, $p < .001$) (Table 4).

Table 3. Descriptive statistics of menstrual-cycle length of the girls studied (N=103)

Variable	M	SD	Min	Max
Cycle length, days	29.84	6.07	18	54

M = mean; SD = standard deviation; Min = minimum value; Max = maximum value.

In the study group, absence of features suggestive of ovulation was recorded more frequently among girls who had been menstruating for a relatively short period (up to three years). In this group, no features suggestive of ovulation were recorded in 29.2% of participants, compared with 14.5% in the group who had been menstruating for longer. These findings indicate that the absence of features suggestive of ovulation was observed more frequently among adolescents whose menarche had occurred relatively recently.

4.3. Observation of cervical mucus, the rise in basal body temperature and features suggestive of ovulation

An important element of menstrual-cycle self-observation in adolescents is monitoring the so-called principal fertility indicators, including daily measurement of basal body temperature and observation of the occurrence and changing characteristics of cervical mucus. Other symptoms that may accompany the peri-ovulatory period, such as ovulatory pain or breast enlargement and tenderness, may also play

Table 4. Categories of luteal-phase length according to gynaecological age

Luteal-phase category	Up to 3 years, N	%	More than 3 years, N	%	Total, N	%
Missing data	1	2.1	2	3.6	3	2.9
No features suggestive of ovulation	14	29.2	8	14.5	22	21.4
6–10 days	18	37.5	7	12.7	25	24.3
11–14 days	10	20.8	33	60.0	43	41.7
≥15 days	5	10.4	5	9.1	10	9.7
Total	48	100.0	55	100.0	103	100.0

Due to the small numbers in the original luteal-phase categories, these were combined into the intervals 6–10 days, 11–14 days and ≥ 15 days. Three cases with missing data were excluded from the inferential analysis. $\chi^2(3, N = 100) = 18.49$, $p < .001$.

a role. Particular importance is attached to recognising the characteristics of mucus occurring during the cycle. Data concerning the mucus observed by the participants are presented in Table 5.

Approximately 10% of respondents did not record the occurrence of cervical mucus on their observation charts. The empirical data showed that 60.2% of the adolescents first observed mucus between days 11 and 20 of the cycle. In 26.2% of participants, mucus appeared earlier, between days 5 and 10. Only three participants observed their first mucus between days 21 and 30. No statistically significant differences were found between the gynaecological-age groups in the day of first observation of cervical mucus ($p = .282$).

Among the adolescents studied, the first appearance of mucus occurred between days 5 and 28 of the cycle, with the mean falling around days 11–12 ($M = 11.84$). The results nevertheless showed substantial variation ($SD = 3.53$). Particular importance was attached to identifying fertile-type mucus. The relevant data are presented in Table 6.

The results show that a greater proportion of adolescents who had been menstruating for less than three years had no record of fertile-type mucus than girls whose gynaecological age exceeded three years. The corresponding proportions were 29.2% in the shorter-duration group and 12.7% in the longer-duration group. Most respondents, both among girls menstruating for up to three years (58.3%) and those menstruating for longer (65.5%), observed fertile-type mucus between days 11 and 20 of the cycle. The differences between the groups were not statistically significant ($p = .110$).

The self-observations were also analysed in an attempt to determine the so-called mucus peak day, defined as the last day on which fertile-type mucus occurred. Participants located this point at different stages, between days 12 and 38 of the cycle, with the largest number of observations falling on days 19–20 ($M = 19.68$), indicating considerable variation ($SD = 4.70$).

Table 5. Day of first observation of cervical mucus according to gynaecological age

First observation of cervical mucus	Up to 3 years, N	%	More than 3 years, N	%	Total, N	%
No record	5	10.4	6	10.9	11	10.7
Days 5–10 of cycle	14	29.2	13	23.6	27	26.2
Days 11–20 of cycle	26	54.2	36	65.5	62	60.2
Days 21–30 of cycle	3	6.3	0	0.0	3	2.9
Total	48	100.0	55	100.0	103	100.0

The Fisher–Freeman–Halton exact test was used to compare the distribution of the first observation of cervical mucus between the groups, $p = .282$.

Table 6. Observation of fertile-type mucus according to gynaecological age

Observation of fertile-type mucus	Up to 3 years, N	%	More than 3 years, N	%	Total, N	%
No record	14	29.2	7	12.7	21	20.4
Days 5–10 of cycle	5	10.4	5	9.1	10	9.7
Days 11–20 of cycle	28	58.3	36	65.5	64	62.1
Days 21–30 of cycle	1	2.1	5	9.1	6	5.8
After day 30 of cycle	0	0.0	2	3.6	2	1.9
Total	48	100.0	55	100.0	103	100.0

The Fisher–Freeman–Halton exact test was used to compare the distribution of observations of fertile-type mucus between the groups, $p = .110$.

So-called disturbances in the observation of mucus secretion were relatively uncommon. Most girls—83.3% of those menstruating for up to three years and 80% of those menstruating for longer—reported no problems in this respect. A small proportion reported uncertainty associated with the use of sanitary pads (3.9%) or medication that could affect mucus characteristics (4.9%).

Another important indicator regarded as suggestive of ovulation is a rise in basal body temperature (Table 7).

The data in Table 7 indicate that a characteristic rise in BBT, regarded under the adopted criteria as a feature suggestive of ovulation, was observed in 70.8% of girls menstruating for less than three years and 81.8% of girls with longer menstrual experience. No such rise was recorded in 19.4% of participants. There were no statistically significant differences between the gynaecological-age groups in the observation of a BBT rise (p = .389).

Respondents were also asked about difficulties associated with observing a biphasic BBT pattern. Some form of disturbance was reported by 34% of participants, whereas 61.2% reported no such problems.

A relationship between the occurrence of fertile-type mucus and a rise in basal body temperature was observed in 54% of all girls studied. In the younger gynaecological-age group, the two features co-occurred in 48% of participants, compared with 60% in the older group. The difference was not statistically significant (p = .219).

Participants also reported additional indicators accompanying ovulation, such as ovulatory pain and breast changes. Only 8.7% of adolescents recorded such symptoms on their observation charts, whereas 91.3% did not record them. Gynaecological age did not significantly differentiate these results.

According to the adopted self-observation criteria, no features suggestive of ovulation were recorded in 22 of the 103 charts analysed (21.4%). This applied to 14 of 48 charts (29.2%) in the group menstruating for up to three years and 8 of 55 charts (14.5%)

Table 7. Observation of the rise in basal body temperature according to gynaecological age

Rise in BBT	Up to 3 years, N	%	More than 3 years, N	%	Total, N	%
No record or observation	1	2.1	0	0.0	1	1.0
Rise in BBT observed	34	70.8	45	81.8	79	76.7
No rise in BBT observed	12	25.0	8	14.5	20	19.4
Rise in BBT could not be determined	1	2.1	2	3.6	3	2.9
Total	48	100.0	55	100.0	103	100.0

BBT = basal body temperature. The Fisher–Freeman–Halton exact test was used to compare the distribution of observed BBT rises between the groups, p = .389.

Table 8. Occurrence of menstrual pain according to gynaecological age

Menstrual pain	Up to 3 years, N	%	More than 3 years, N	%	Total, N	%
Pain present	3	6.3	15	27.3	18	17.5
No pain	20	41.7	17	30.9	37	35.9
Missing data	25	52.1	23	41.8	48	46.6
Total	48	100.0	55	100.0	103	100.0

When all three categories were analysed, $\chi^2(2, N = 103) = 7.89$, p = .019. For the complete observations (n = 55), Fisher's exact test was used, p = .010.

in the group menstruating for longer. This finding concerns features recorded on the observation charts and does not constitute clinical confirmation of an absence of ovulation.

4.4. Menstrual pain and intermenstrual spotting in the observations of the adolescents studied

Experiencing menstrual pain is an important health problem among adolescents. Data concerning this phenomenon, obtained from the cycle-observation charts completed by the girls, are presented in Table 8.

Intermenstrual spotting was recorded in 3.9% of the adolescents studied. No cases of spotting were recorded in the group of girls who had been menstruating for more than three years. The difference between the groups was statistically significant ($p = .044$). It may therefore be concluded that intermenstrual spotting was recorded more frequently among girls who had begun menstruating relatively recently. The phenomenon was absent in 96.1% of the adolescents studied.

The results suggest that maintaining menstrual-cycle observation charts may have educational value and may encourage greater attention to changes occurring during the cycle. Following prior training, most of the girls studied were able to record selected cycle parameters in accordance with the adopted self-observation protocol. However, the study did not include independent validation of the accuracy of these observations.

5. Discussion

From both clinical and educational perspectives, learning to observe the menstrual cycle may increase awareness of changes that could require medical consultation and may foster a sense of responsibility for one's own health (Duane et al., 2022).

The aim of the study was to characterise menstrual cycles in adolescent girls on the basis of data obtained from their observation charts. The findings are broadly consistent with the literature, although differences can also be identified in certain respects and merit detailed analysis. Variation in menstrual cycles during adolescence has likewise been highlighted by Ślizień-Kuczapska et al. (2020).

Despite their relatively limited experience of observation, most girls were able to document cycle symptoms systematically. The possibility of systematically monitoring menstrual parameters in young adolescents has also been demonstrated in a prospective study using a mobile application (Bala et al., 2024). The present findings indicate considerable variation in adolescent menstrual cycles, both in length and in the characteristics of fertility biomarkers. Following menarche, menstrual cycles in most adolescent girls gradually stabilise over approximately 3–5 years, in association with maturation of the hypothalamic–pituitary–ovarian axis (Troszyński, 2009; Harley et al., 2024; Sun et al., 2019). Contemporary data confirm that gynaecological age is important in characterising the menstrual cycle. Harley et al. (2024), analysing 38,916 cycles in 6,486 adolescents, found that the frequency of highly variable, short and long cycles decreased as time since menarche increased. Similarly, Naveed and Whooten (2024) report that cycle regularity increases with time since menarche.

The mean age of the participants was approximately 16 years and four months, corresponding to late puberty. At this stage, most girls would be expected to have menstrual cycles that are already more stable in terms of length and regularity (Anthon et al., 2024). In interpreting adolescent cycles, however, not only chronological age but also gynaecological age—the time elapsed since menarche—should be taken into account (De Sanctis et al., 2019; Harley et al., 2024).

In the present study, the most frequently reported duration of menstrual bleeding was six days (31.1%), while more than 20% of girls experienced five-day bleeding. Only 6.8% reported bleeding lasting nine days. These figures correspond to data reported by Piasecka, according to which mean menstrual duration in a population of women was slightly more than five days (Piasecka et al., 2022). Current data indicate that menstrual bleeding in adolescents most commonly lasts 3–7 days, whereas longer bleeding may require further clinical assessment, particularly when it is heavy or impairs functioning (Itriyeva, 2022).

The shortest duration of menstrual bleeding in the study group was three days and the longest was nine days. The analyses established a minimum menstrual-cycle length of 18 days and a maximum of 54 days. The mean cycle length in girls menstruating for a shorter period (up to three years) was approximately 28–29 days (M_1 = 28.73), whereas among adolescents whose time since menarche was longer it was approximately 30–31 days (M_2 = 30.8). These findings are similar to Deluga's observation of a mean menstrual-cycle length of 28.6 days in adult women (Deluga, 2000). Piasecka et al. likewise found an average menstrual cycle of approximately 28 days. However, in that study it had not previously been established whether the younger group consisted only of women with medium-length cycles (26–30 days), or whether the older group consisted only of women with longer cycles (above 31 days) (Piasecka et al., 2022). According to Itriyeva (2022), most adolescent cycles fall within the range of 21–45 days. The extreme values observed in the present study, 18 and 54 days, therefore fall outside the typical range.

With regard to luteal-phase length, the most frequently observed duration among the adolescents studied was 13 days, consistent with the findings of Piasecka et al. concerning adult women (Piasecka et al., 2022). According to the current position of the American Society for Reproductive Medicine, a typical luteal phase lasts approximately 12–14 days and may range from 11 to 17 days, whereas a luteal phase lasting ≤10 days may indicate a shortened luteal phase (Practice Committee of the American Society for Reproductive Medicine & Practice Committee of the Society for Reproductive Endocrinology and Infertility, 2026). When interpreting the findings in adolescents, however, the gradual maturation of ovulatory function must be considered. Sun et al. (2019) demonstrated that healthy girls after menarche may experience anovulatory cycles, ovulatory cycles with a short luteal phase, and ovulatory cycles with a normal luteal phase, indicating gradual maturation of the reproductive axis. This process is also the subject of the three-year longitudinal A Girl's First Period Study, which aims to characterise hormonal changes from the period following menarche to the development of mature ovulatory cycles (Lucien et al., 2022).

One of the key elements of self-observation within fertility-awareness methods is monitoring cervical mucus, basal body temperature and other indicators that permit assessment of changes associated with the peri-ovulatory period. Individual methods of ovulation monitoring differ, however, in the information they provide and, in their ability, to confirm that ovulation has occurred (Wegrzynowicz et al., 2024). The present findings indicate that 60.2% of the adolescent respondents observed the first appearance of mucus between days 11 and 20 of the cycle, whereas in 26.2% it appeared earlier, between days 5 and 10. By comparison, women in the study by Piasecka et al. (2022) recorded the first occurrence of mucus around day 9 of the cycle, which is consistent with the observations of the 26.2% of adolescents in the present study.

Fertile-type mucus was recorded by respondents between days 7 and 35 of the cycle, with the mean day of occurrence being approximately day 16 (M = 15.93). Similar findings were obtained by Piasecka et al., in whose study mucus displaying high-fertility characteristics was also observed on average on day 16. In addition, participants in the present study most frequently recorded the so-called mucus peak between days 19 and 20 (M = 19.68), consistent with the results reported by Piasecka et al. (2022).

The potential for error in assessing fertile-type mucus must nevertheless be taken into account, owing to the participants' early stage of learning cycle observation. Moreover, when only a single cycle is examined, distinguishing the appearance and sensation of mucus may be difficult. In women, the most commonly observed pattern is the 'dry' model: after menstruation, there is an absence of secretion in the vulval area, followed by the appearance of less-fertile mucus, then highly fertile mucus, followed by a return to less-fertile mucus and finally its complete disappearance. In the 'wet' model, constant, unchanging secretion is present after menstruation and produces a sensation of moisture. The first day on which this secretion changes marks the beginning of the fertile period, which ends when the constant, unchanging secretion returns, according to the double-check symptom–thermal method (PSNNPR) (Troszyński, 2009).

No record of fertile-type mucus was found for 29% of girls in the younger gynaecological-age group and 13% in the older group. Most commonly (58% in the younger group and 65.5% in the older group), the sign occurred between days 11 and 20 of the cycle. Most women experienced no difficulty in observing fertile-type mucus.

Additional symptoms that may accompany the peri-ovulatory period, such as ovulatory pain and breast changes, were recorded by 8.7% of respondents. Menstrual pain was recorded in 17.5% of the charts, although 46.6% contained no unambiguous information. Among girls for whom data were available, pain occurred in 13.0% of those within three years of menarche and in 46.9% of those menstruating for longer. These figures are lower than those reported by Białka et al. (2018), who indicate that dysmenorrhoea occurs in 30–70% of adolescents and young women, with symptoms located mainly in the lower abdomen.

A similar phenomenon was described in a 2014 study of pupils from six secondary schools in Turkey, in which as many as 92% of girls reported dysmenorrhoea (Esen et al., 2016). More recent international studies likewise indicate a high prevalence of dysmenorrhoea among adolescents. Nakamura et al. (2025) reported it in 74.9% of participants. Panova et al. (2026), meanwhile, emphasise that cases of dysmenorrhoea unresponsive to initial treatment require reassessment for potential secondary causes, including endometriosis. Comparison of the prevalence of menstrual complaints across studies is further complicated by differences in the measurement instruments used and their validation in adolescent populations (Dixon et al., 2024; Özcan et al., 2024).

It should be noted that, despite the growing number of studies concerning menstruation in adolescents, relatively few have assessed detailed self-observation of fertility biomarkers in groups with characteristics comparable to those of the present participants. For this reason, an attempt was made to compare the present findings with selected studies available in the literature.

In summary, the study indicates considerable variation in the length and characteristics of the observed cycles among the girls studied. Because only one cycle per participant was analysed, however, individual cycle variability over time cannot be assessed on this basis. The findings are therefore consistent with literature indicating gradual maturation of reproductive function after menarche (Harley et al., 2024; Lucien et al., 2022; Sun et al., 2019). At the same time, the results highlight the importance of educating young women in menstrual-cycle self-observation and interpretation of fertility signs, both to increase awareness of their own procreative health and to identify changes requiring medical consultation. It should be emphasised that fertility-awareness methods, whose effectiveness depends on the method used and the correctness of its application, and which are non-invasive, constitute a valuable, accessible and low-cost means of supporting family planning and monitoring procreative health (Duane et al., 2022; Troszyński, 2009). Wider promotion of cycle self-observation may increase awareness of procreative health. The importance of such observation is supported by contemporary evidence identifying menstrual-cycle characteristics as an important health indicator (Rosen Vollmar et al., 2025).

6. Conclusions

1. The study group included girls whose gynaecological age ranged from one to six years. Among girls who had been menstruating for a shorter period, up to three years after menarche, mean cycle length was approximately 28–29 days, whereas among adolescents with longer menstrual experience, exceeding three years, cycles averaged 30–31 days. This difference was not statistically significant.
2. Most girls experienced no difficulty in observing the rise in BBT. Following prior training, most participants were able to record selected cycle parameters in accordance with the adopted self-observation protocol. The study did not, however, include independent validation of the accuracy of these observations.
3. Menstrual pain was recorded in 17.5% of all charts; however, because 46.6% of observations contained no unambiguous information con-

cerning pain, this finding requires cautious interpretation. Among participants with complete data, pain was recorded more frequently in the group of girls who had been menstruating for more than three years. Intermenstrual spotting was uncommon.

4. The findings indicate that the menstrual cycles observed in adolescent girls varied considerably, both in length and in the occurrence of individual cycle symptoms.
5. Hypothesis H1 was not confirmed because the difference in mean menstrual-cycle length between the groups was not statistically significant ($p = .084$). Hypothesis H2 was not statistically confirmed; although the proportion of cycles without features suggestive of ovulation was higher in the group within three years of menarche, the difference was not statistically significant ($p = .093$).
6. The findings indicate a need for wider implementation of educational programmes teaching young girls practical skills in observing and interpreting menstrual cycles. Menstrual-cycle observation may support greater awareness of biological processes occurring in the body.
7. Mobile applications for cycle tracking and conception planning are playing an increasingly important role, providing educational functions and supporting the monitoring of cycles and fertility (Lyzwinski et al., 2024).
8. The present study addresses a topic that is rarely examined in Poland, highlighting its originality and indicating the need for further research in this area.

Limitations of the study

The researchers nevertheless point to an important limitation arising from the fact that the analysed material comprised only a single, third observed cycle for each adolescent. This may have substantially affected the objective assessment of the girls' ability to recognise cervical-mucus characteristics. The methodology used to obtain the research material constitutes a significant limitation of the project. This stems from the small number of certified instructors of the method, which directly resulted in a limited number of observation charts being collected and restricted the sample size. The characteristics of the adolescent age group were associated with difficulties in systematically recording fertility indicators. Consequently, only one, the most complete, chart from the three observations conducted by each participant was included in the final analysis. The research material was collected between 2016 and 2021, which involved a considerable workload and long-term commitment. This may explain why comparable studies are relatively uncommon in the literature. Owing to the specific sampling procedure, the group analysed was non-representative; the final sample comprised 103 cycle-observation charts. A further methodological limitation was the use of purposive and voluntary sampling. This recruitment strategy increases the risk of selection bias and limits the generalisability of the findings to the adolescent population as a whole. The sample consisted exclusively of girls who were personally motivated to learn menstrual-cycle observation, and therefore did not reflect the attitudes of their wider peer group. Another methodological weakness was the inclusion of a broad age range (12–19 years). Combining, within a single analysis, charts from adolescents in early puberty with data from girls with a more mature hormonal profile may distort patterns characteristic of particular developmental stages. The group varied considerably not only in the maturity of the hypothalamic–pituitary–ovarian axis but also in its ability to maintain detailed observation charts. An important limitation is the absence of comparison between self-observation findings and clinical reference standards. Because the study was limited to analysis of existing documentation, validation of the accuracy of fertility-marker recognition could not be performed. The findings should therefore be interpreted cautiously, since information concerning participants' health status (chronic diseases, endocrine and nutritional disorders) and lifestyle (stress, diet, BMI) was not available, preventing complete elimination of potential confounding factors. The available documentation also contained no information on

whether participants continued self-observation after completing the project or on their subjective assessment of its usefulness.

Acknowledgements

We would like to thank Andrew Zachary Warchoł for translating the original manuscript into English.

Funding

This article was funded by the Polskie Stowarzyszenie Nauczycieli Naturalnego Planowania Rodziny (PSNNPR) [Polish Association of Natural Family Planning Teachers] , Mazowiecka St., 11/21, 00-052 Warsaw, Poland; e-mail: biuro@psnnpr.com

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